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egg prices
and the FACTORS that INFLUENCE THEM

Marketing Bulletin 5
UNITED STATES DEPARTMENT OF AGRICULTURE - AGRICULTURAL MARKETING SERVICE

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PREFACE

Our purpose in this bulletin is to present the more important results of a research study of egg prices and the factors that influence them.[1] The findings are presented in nontechnical language as an aid to producers, marketing agencies and others engaged in this important agricultural industry.

Explanation of why prices and production of eggs vary from year to year is complex. However, examination of the major relationships and variables that make up the egg industry is helpful in understanding how factors which arise both within the egg industry and outside it influence the price and production of eggs. Within it, there are such influences as numbers of layers on farms and replacement pullets raised. Factors primarily determined by forces outside the egg industry are such things as income, population, and the general price level.

The economist has a number of statistical tools available for obtaining measures of economic relationships. In many cases, the tool selected depends on whether the economist is trying to get the best answer to a single question, or whether he is trying to get consistent answers to a number of related questions. Often, the answers obtained are the same. Sometimes, they differ. In this bulletin, where answers differ greatly because of the choice of technique, both answers are given. Readers who are interested in further elaboration of these differences should refer to the more detailed report from which this bulletin is drawn.

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[1] Martin J. Gerra. The Demand, Supply, and Price Structure for Eggs. U.S. Department of Agriculture, Technical Bulletin 1204, November 1959. 157 pages. Available from: Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price 50 cents.

Egg Prices

. . . and the Factors That Influence Them

*by Martin J. Gerra and Wayne Dexter**

INTRODUCTION

The egg producer not only needs to be skilled in the production and marketing of his product; he needs also the courage and the financial resources to take the lean years with the good.

Although eggs are a leading money farm product—over the last decade farmers' receipts from eggs ranked fifth among the products of U.S. farms—receipts from eggs are more variable than those of many commodities. The average change from year to year during the 1949–58 decade was 12 percent. The largest change was 31 percent and the smallest 2 percent.

Changes in prices farmers received for eggs accounted for most of this variation in receipts. The average annual change for the decade was 14 percent, ranging from a high of 31 percent to a low of 1 percent.

Production was much more stable. The change from one year to the next averaged 1½ percent. Five years showed variations of 1 percent or less. The largest change was 5 percent.

Obviously, an understanding of the behavior of egg prices is essential to the study of any economic problem of the industry.

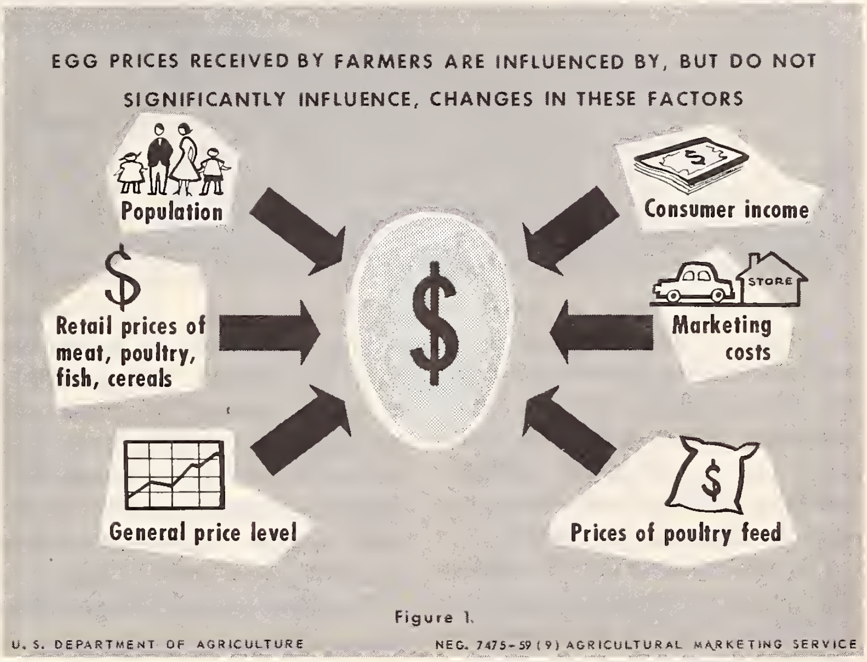
EGG PRICES RECEIVED BY FARMERS ARE INFLUENCED BY, BUT DO NOT SIGNIFICANTLY INFLUENCE, CHANGES IN THESE FACTORS
Population
Consumer income
Retail prices of meat, poultry, fish, cereals
Marketing costs
STORE
General price level
Prices of poultry feed
$
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Figure 1.

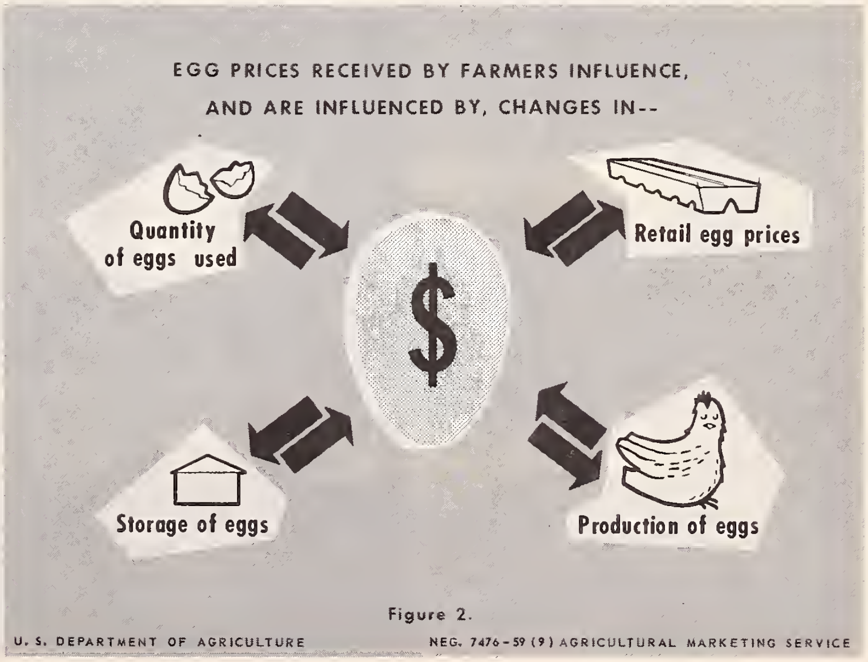
EGG PRICES RECEIVED BY FARMERS INFLUENCE, AND ARE INFLUENCED BY, CHANGES IN--
Quantity of eggs used
Retail egg prices
Storage of eggs
Production of eggs
$
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Figure 2.

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*Analytical Statistician, Agricultural Economics Division, and Secretary, Outlook and Situation Board, respectively, Agricultural Marketing Service.

Our purpose in this bulletin is first to describe the major economic forces affecting farmers' prices for eggs: and second to present measures that are useful for analyzing the current situation and forecasting the future.

The industry won't stand still while we analyze it. Eggs are being produced, marketed, and consumed every day. The national flock fluctuates in size as pullets are added and hens culled. New methods of breeding, rearing chicks, feeding, and other technological innovations are being adopted.

The market is in a similar state of flux. Population growth daily adds new consumers. The amount of income they have to spend is trending up and the choice of foods and other goods and services on which they spend it is expanding. Their tastes and preferences are changing, perhaps imperceptibly in the shortrun, but over the longrun appreciably.

Our method is to take the major influences on egg prices and examine them one by one, assuming for the moment that other influences do not change. Then we put the individual pieces of information together to see if they shed some light on how prices are determined in the egg industry as a going concern.

This procedure is a bit like putting a motion picture film through a projector a frame at a time, and then running it at normal speed.

We give emphasis at first to factors that determine the annual average prices received by all producers in the United States. Then we discuss briefly differences by seasons, among regions, and among grades. The year, in this case, is the conventional calendar year which begins January 1. Somewhat different results might be obtained if another 12-month grouping was used.

The Part and the Whole

The egg industry, one of agriculture's largest, is part and parcel of the American economy. As such, it is affected by, and to some extent affects, the Nation's level of economic activity.

Many of the factors affecting egg prices received by farmers are influenced little, if at all, by developments in the egg industry. (These are illustrated in figure 1.) We know, for example, that the level of income received by consumers partly determines how much money they have to spend on eggs and other goods; thus it affects egg prices. But a change in egg prices has no perceptible effect on consumer income. Even a drastic change in prices that would greatly increase or decrease income of poultrymen would have almost no measurable effect on the total income received by consumers in the United States.

The same is true for the other factors illustrated in figure 1. In greater or lesser degree all these factors affect the price producers receive for eggs in any year, but the effect is one-way.

Figure 2 illustrates four factors that influence, and are influenced by, changes in prices farmers receive for eggs. An example of this two-way effect is the relation between farmers' prices and production of eggs. The quantity of eggs farmers produce influences the price they receive. And the price received affects the quantity produced later on. Similarly, egg consumption, retail prices, and storage are linked in a back-and-forth relation with changes in prices for eggs.

Figures 1 and 2 illustrate the more important factors influencing farmers' prices for eggs, and the direction in which the influence operates. Now, let's examine more closely each of these factors.

CHANGES IN SUPPLY

Egg prices not only rise and fall with changes in supply, but they usually change by a considerably

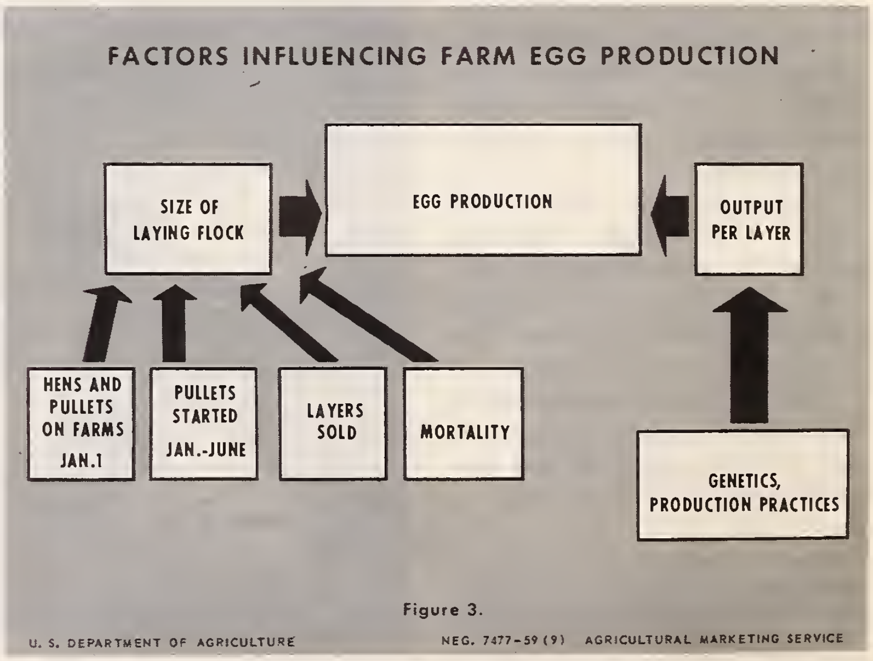
FACTORS INFLUENCING FARM EGG PRODUCTION
SIZE OF LAYING FLOCK
EGG PRODUCTION
OUTPUT PER LAYER
HENS AND PULLETS ON FARMS JAN.1
PULLETS STARTED JAN.-JUNE
LAYERS SOLD
MORTALITY
GENETICS, PRODUCTION PRACTICES
U. S. DEPARTMENT OF AGRICULTURE
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Figure 3.

larger percentage. Thus, a first step in analyzing what influences egg prices is to determine what causes farmers to produce more or less.

The quantity of eggs produced in a year depends on the number of layers on farms and the rate at which they lay. Figure 3 shows the main influences on numbers of layers and rates of lay. In this figure, as in similar diagrams in this bulletin, arrows show the direction of influence from one factor to another. Solid arrows show major, and dashed arrows minor, paths of influence.

Output per layer in a particular year largely represents the result of previous trends in breeding and in production practices, though it may be influenced to some extent by other factors. As a rule, farmers attempt to get as high a rate of lay per bird as possible.

Two of the four factors bearing on the size of the laying flock also are subject to little control by producers during a particular year. The number of layers on hand at the beginning of the year is fixed for that year. It is the result of previous adjustments made by farmers. Mortality, or death losses, in laying flocks mainly reflects disease control and sanitation practices. Although favorable prices might cause farmers to pay increased attention to the health of their flocks, producers probably try at all times to keep mortality to a minimum.

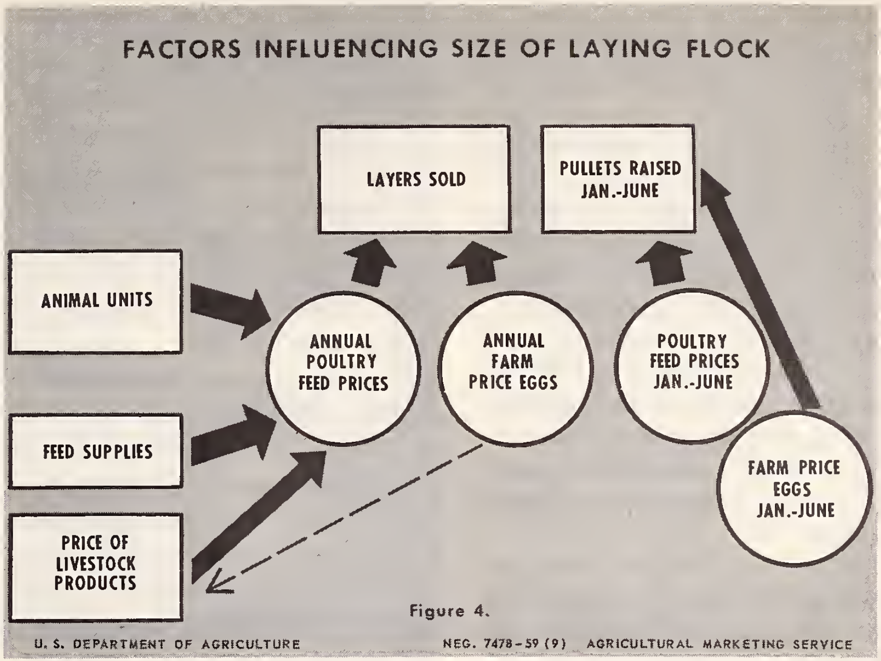

FACTORS INFLUENCING SIZE OF LAYING FLOCK
LAYERS SOLD
PULLETS RAISED JAN.-JUNE
ANIMAL UNITS
FEED SUPPLIES
PRICE OF LIVESTOCK PRODUCTS
ANNUAL POULTRY FEED PRICES
ANNUAL FARM PRICE EGGS
POULTRY FEED PRICES JAN.-JUNE
FARM PRICE EGGS JAN.-JUNE

Figure 4.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7478-59 (9) AGRICULTURAL MARKETING SERVICE

Factors Affecting Flock Size

The two main ways in which farmers control the size of their flocks and adjust egg production during a year are by changes in the number of pullets raised and in the number of layers sold. Farmers' decisions as to how many pullets to add to their flocks and how many layers to sell are influenced by a variety of forces. (See fig. 4.) High egg prices in relation to prices for feed may lead farmers to increase the number of pullets raised and reduce the number of hens sold. A low egg-feed price ratio will have the opposite effect. Feed prices, in turn, are affected by the number of livestock to be fed, the supplies of feed available, and the prices of livestock and livestock products.

Study of the data for past years on the factors illustrated in figures 3 and 4 indicates that changes in the ratio of prices farmers receive for eggs to the prices they

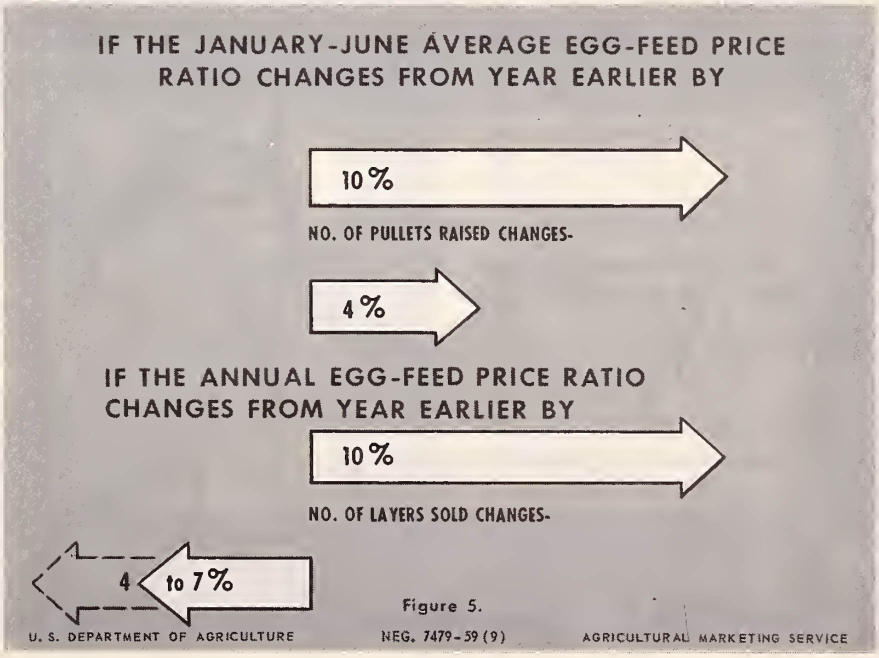


Figure 5.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7479-59 (9) AGRICULTURAL MARKETING SERVICE pay for feed are a guide to changes in the number of pullets they raise and the number of layers they sell.

The number of layers removed from flocks is also influenced by the number of potential layers on farms at the beginning of the year. This effect is interrelated with the current profitability of egg production. Over the extent of a year, we assume that the net result of these forces and decisions will be reflected in more layers being removed from flocks in unfavorable years than in years of good returns.

It has been found that, on the average, a change of 10 percent in the January–June average egg-feed price ratio is accompanied by a 4-percent change in the same direction in the number of pullets raised.

On the average, a 10-percent change in the annual average egg-feed price ratio is accompanied by a 4- to 7-percent change, in the opposite direction, in the number of layers removed from flocks.

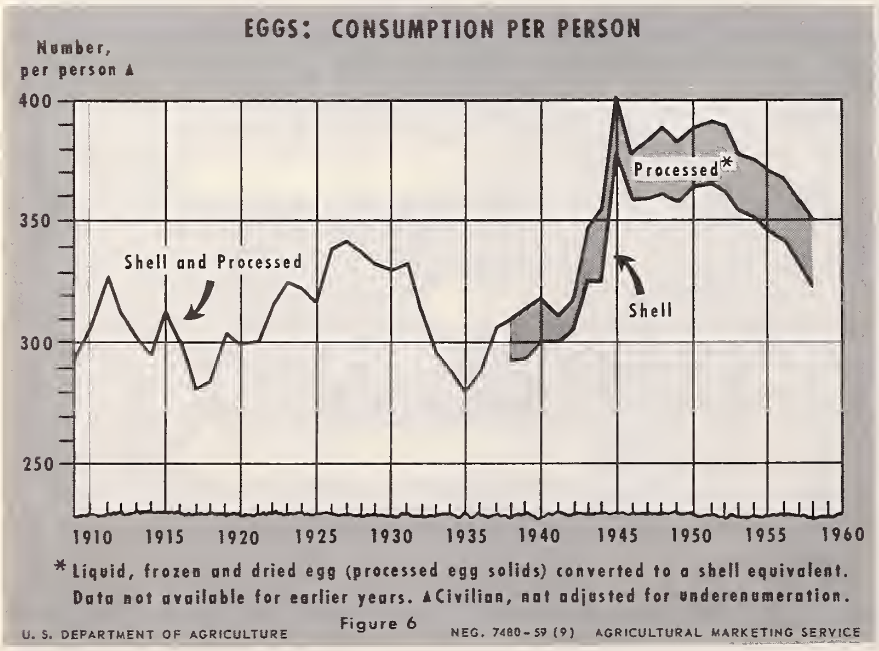
These relationships are illustrated in figure 5.

CHANGES IN CONSUMPTION

The number of eggs consumed per person has been variable over the years. Consumption trended upward in the first quarter of this century, dipped to a low in the depression of the 1930's, then climbed rapidly during World War II, when supplies of many foods were tight. (See fig. 6.)

Most eggs reach the consumer in the shell. Use in liquid, frozen, and dried forms in recent years has amounted to the equivalent of only about 25 to 30 eggs per person, 7 percent or less of the per-person total. Most of these are used by bakeries, in packaged cake mixes, in salad dressings, and for noodles and similar products.

The supply of eggs available to consumers in a given year is determined almost entirely by production in that year. Use for hatching, the chief nonfood outlet, accounts for less than 5 percent of production. Most of the eggs stored are used in the same year, so carryover stocks on January 1 are low. Exports are small and imports almost negligible in relation to production. Consequently, changes in the supply of eggs available to consumers from year to year depend mainly on changes in production.



* Liquid, frozen and dried egg (processed egg solids) converted to a shell equivalent. Data not available for earlier years. ▲Civilian, not adjusted for underenumeration.

U. S. DEPARTMENT OF AGRICULTURE Figure 6 NEG. 7480-59 (9) AGRICULTURAL MARKETING SERVICE

Production, Consumption, and Price

Production, consumption, and price of eggs are closely tied to one another, as shown in figure 7. The quantity produced affects the level of consumption, the retail price, and the farm price. And the farm price, as we saw in the preceding section, influences the number of eggs produced through its effect on the number of pullets farmers raise and the number of layers they sell.

This back-and-forth relationship is different from the relationships for many other farm products. For example, the quantity of watermelons produced in a particular year is determined by weather and economic influences before harvest. Once the crop is harvested, the supply for that year is fixed. It moves to market and the price adjusts. Supply is not affected by the prices received in the current year except in the unusual circumstance that the price falls below the cost of harvesting and part of the crop is left in the field.

The interaction of production, consumption, and price makes it difficult to measure the demand for eggs—the price consumers will pay for various quantities. Demand depends partly on the number of people in the country, the amount of money they have to spend, and the way they decide to spend it. The income of consumers and the prices of eggs and other commodities are partly de-

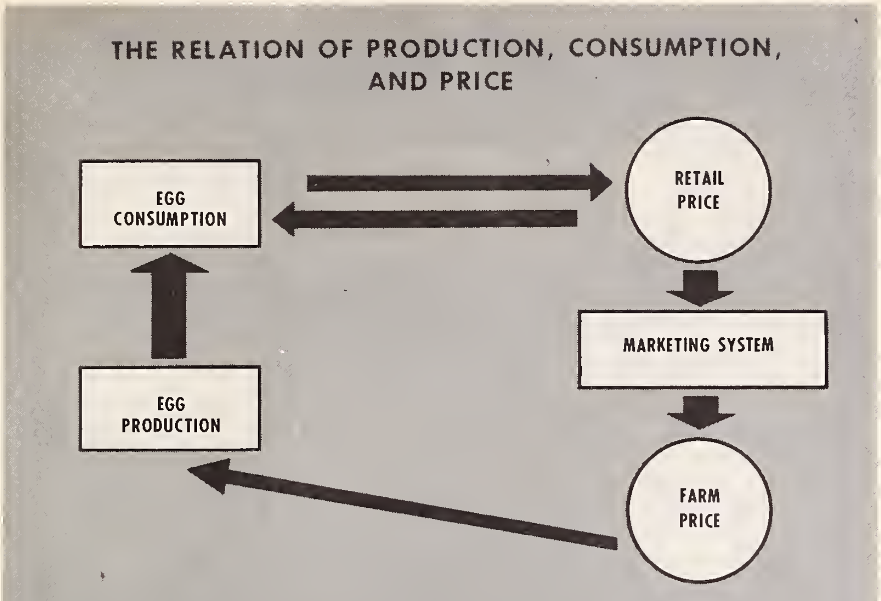


Figure 7.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7481-59 (9) AGRICULTURAL MARKETING SERVICE

termined by the level of prices generally.

Eggs are in competition with other foods such as meat, poultry, fish, cheese, and breakfast cereals. The way egg prices compare with prices for these foods will have some influence on the choices of consumers. Another kind of relation exists between eggs and bacon. Since the two are often eaten together, low prices for bacon may tend to encourage use of eggs, and vice versa. Figure 8 illustrates the behavior of some of the factors affecting the consumption and prices of eggs.

When we allow for the back-and-forth relationship discussed above, we see that a change in the retail price of eggs usually is accompanied by a considerably smaller variation in consumption. ~~Our~~ One study shows that a 10-percent change in the retail price usually is associated with a change of 4 percent in the opposite direction in consumption of eggs per person. If we do not allow for the back-and-forth relationship, but only consider the change in consumption that would be expected for a given price change, we get a lower estimate—a 10-percent change in retail price is associated with a change of 1 percent in the opposite direction in consumption of eggs per person (fig. 9).

This means that to increase consumption per person by 1 percent, retail prices would have to be reduced much more than 1 percent. If an increase in consumption is obtained, total expenditures for eggs would decline. This results from the fact that the price consumers pay declines more than the increase in purchases.

~~Our~~ This study also shows, on the basis of data for the last 25 years, that if income per person increases by about 10 percent, and the price of eggs and other variables remains unchanged, egg consumption per person rises about 1 percent (fig. 10).

The price consumers pay for eggs at retail is linked to the price received by farmers through the marketing system, as shown in figure 7. The price the farmer gets is the retail price minus charges for marketing.

Some of these charges, such as processing, transportation, and containers, are fixed, in the sense that they do not vary with prices for eggs. In wholesaling and retailing, percentage markups are commonly used which, of course,

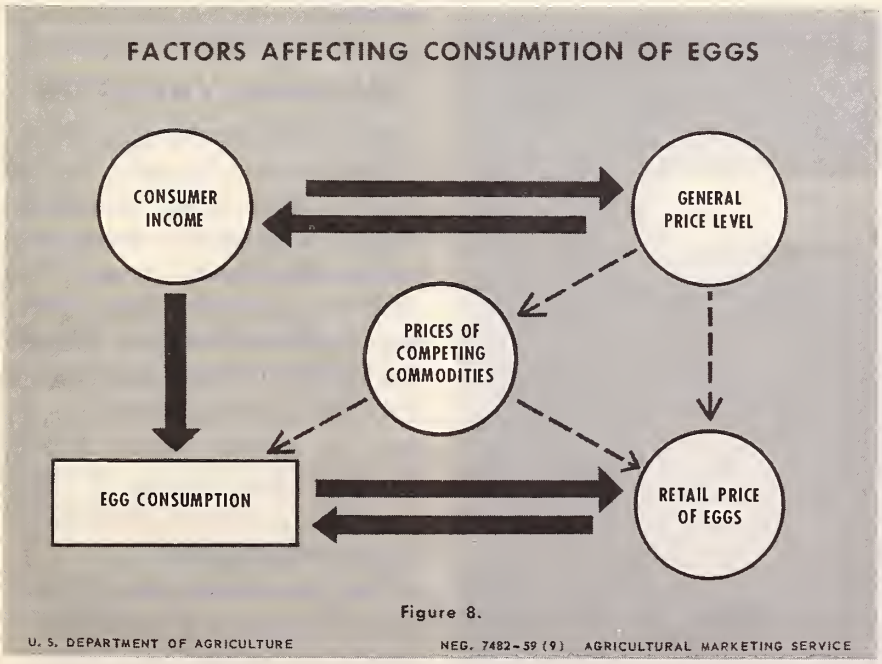


Figure 8.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7482-59 (9) AGRICULTURAL MARKETING SERVICE do change with prices. During the last 10 years marketing costs have accounted for about 30 cents of each dollar the consumer pays for eggs.

On the average, a 10-percent change in the retail price of eggs is associated with a change of 13 percent in the same direction in the price the farmer receives (fig. 11).

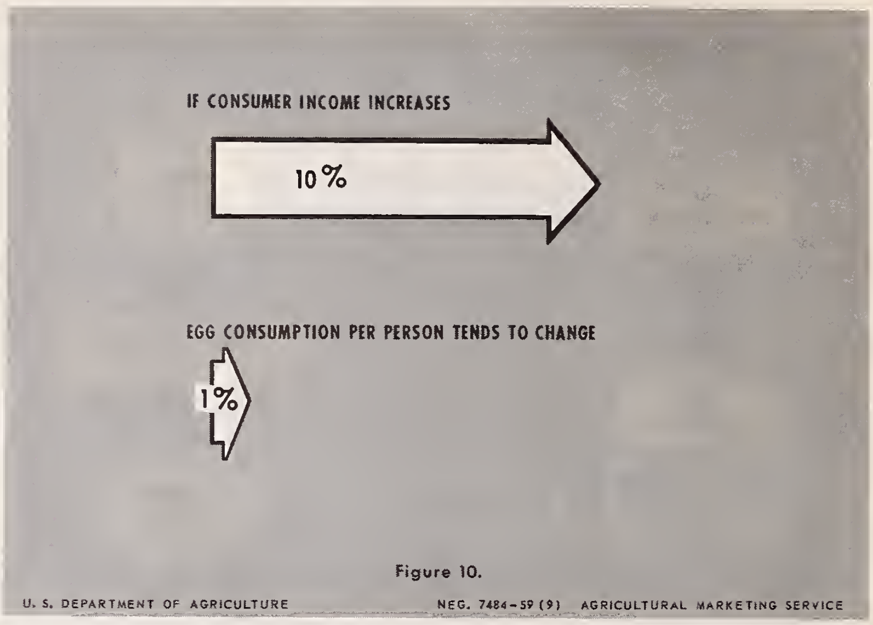

IF CONSUMER INCOME INCREASES
10%
EGG CONSUMPTION PER PERSON TENDS TO CHANGE
1%

Figure 10.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7484-59 (9) AGRICULTURAL MARKETING SERVICE

RELIABILITY OF RELATIONSHIPS

Each of the relationships we have discussed falls within certain ranges of error. When we allow for the error range, for example, in the relationship between the egg-feed price ratio and the number of pullets raised, we see that 2 times out of 3 a 10-percent change in the January–June egg-feed price ratio would be associated with a 3- to 5-percent change in the number of pullets raised. A 10-percent change in the annual average egg-feed price ratio 2 times out of 3 would be associated with a 3- to 9-percent change in the opposite direction in the number of layers removed from flocks. For the demand relationships we have discussed, a 10-percent change in the price of eggs 2 times out of 3 would be associated with a 2- to 6-percent change in the opposite direction in consumption of eggs per person (allowing for back-and-forth relationship of price and production), or a zero to 2-percent change in the opposite direction in consumption of eggs per person (not allowing for back-and-forth relationship). For the retail-farm price relationship, a 10-percent change in retail price 2 times out of 3 would be associated with a 12- to 14-percent change in farm price of eggs. No error range is available for the consumption-income relationship.

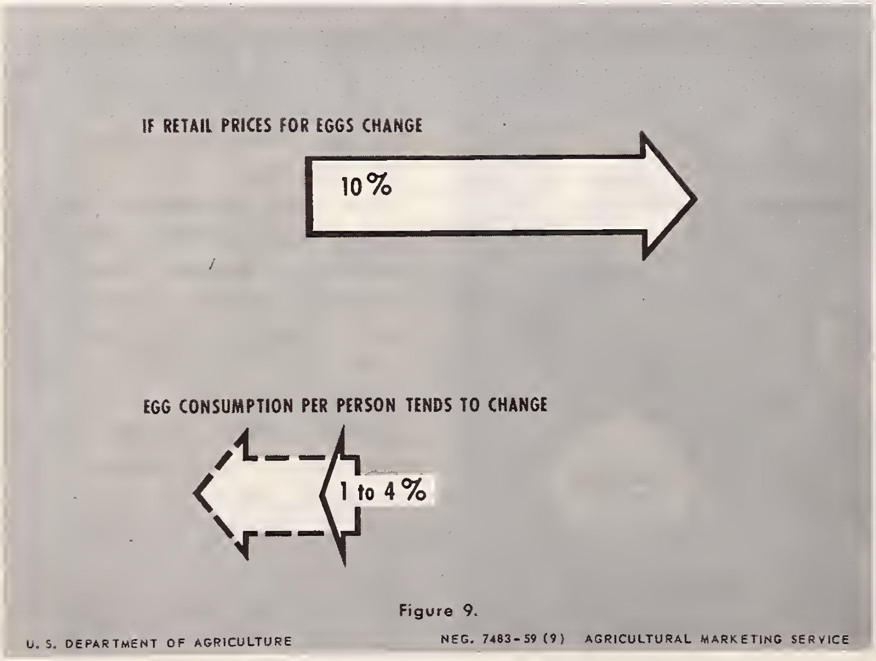

IF RETAIL PRICES FOR EGGS CHANGE
10%
EGG CONSUMPTION PER PERSON TENDS TO CHANGE
1 to 4%

Figure 9.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7483-59 (9) AGRICULTURAL MARKETING SERVICE

SEASONAL VARIATION

Most chicks for laying flock replacement are hatched in the spring. They start laying at about 5 or 6 months of age and produce for about a year. Toward the end of the laying year, their production tends to fall off. Practically all layers kept beyond their laying year go through a period of several weeks during which moulting occurs. At this time, their production comes to an almost complete halt.

The main reason why farmers favor the spring as a time for starting chicks for laying flock re-

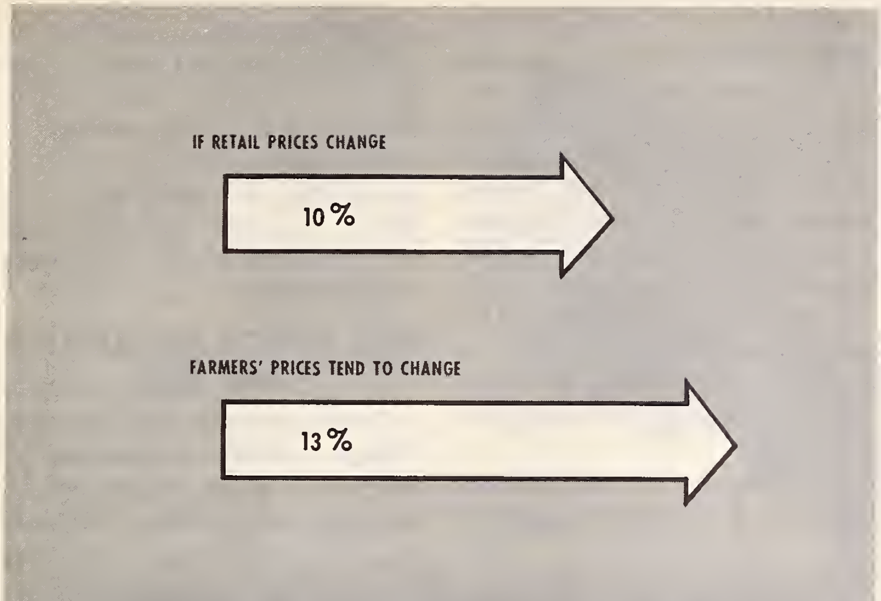


Figure 11.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7485-59 (9) AGRICULTURAL MARKETING SERVICE

placement is that the weather is then most favorable for growth. At this time, also, the economic incentives to start chicks generally are favorable since these pullets will come into production in the fall when egg prices are generally at their high for the year.

Pullets from chicks started in the spring reach peak production late the next winter or spring. Production then declines into the fall.

The timing of the starting of replacement chicks and the physiology of the layer are the main reasons for seasonal differences in production of eggs. In recent years, as shown in the right hand section of figure 12, production reached a seasonal high in the first quarter of the year, and dropped to a seasonal low in the third quarter.

Figure 12 also portrays the striking change in the degree of seasonal variation in production over the last 3 decades. In 1930–32, the spring production peak was about 165 percent of the average monthly production; the low in the fall was only 45 percent. But in 1953–55, the seasonal swings had shrunk to not more than 20 percent above or below the annual monthly average.

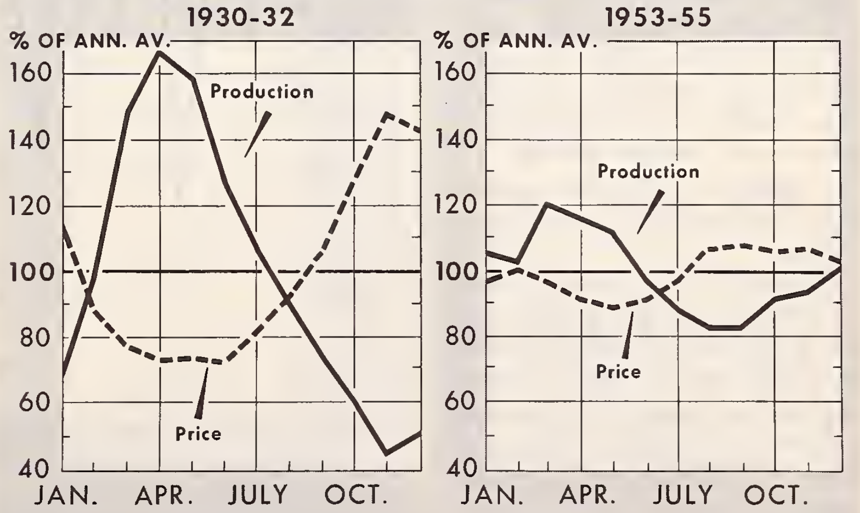
The reduction in the seasonal variation of production over the years has resulted mainly from increasing the production rate per layer during the fall. This was accomplished by the breeding of improved laying-type chickens and by better management practices, including the use of artificial lighting. In addition, producers are starting chicks at an earlier date than formerly so that they will be at a high rate of production when prices are high .

Seasonal Price Changes

Prices received by farmers show a seasonal pattern opposite to that for production, as shown in figure 12. In the spring, when production is seasonally high, prices are seasonally low. In the fall, the situation is reversed.

Figure 12 also reveals that the seasonal swings in prices are noticeably smaller than the changes in production. This results from the diversion of eggs for storage and liquid egg production in spring and their release on the market in fall and later periods.

EGGS: SEASONAL VARIATION OF PRODUCTION AND PRICES RECEIVED BY FARMERS, AVERAGES, 1930-32 AND 1953-55



U. S. DEPARTMENT OF AGRICULTURE Figure 12. NEG. 6103-58(4) AGRICULTURAL MARKETING SERVICE

EGG STORAGE

We have pointed out that stocks of eggs in storage at the beginning of each year usually are so small that they are a minor factor in changes in the total supply of eggs from one year to the next.

Within a calendar year, however, storage is a significant price influence because of the seasonal nature of egg production. In the spring months, during March, April, and May, the supply of fresh eggs is greater than the average monthly supply for the year; during August, September, and October it is less.

In the spring, when the supply is greater than requirements for immediate consumption, eggs go into storage, either in the form of dried or frozen egg, or in the shell. They move out of storage later in the year when farm production declines seasonally.

The price that storers are willing to pay is an important influence on the spring egg market. Spring prices of egg futures contracts for fall delivery indicate the degree of optimism (or pessimism) of storers.

If storage operators expect that egg prices in the fall will pay costs of storage plus a profit, storage in the spring will be active. This will tend to raise prices received by farmers above the prices that would have prevailed if storers had a bearish outlook. On the other hand, the fall price is held down by eggs coming out of storage.

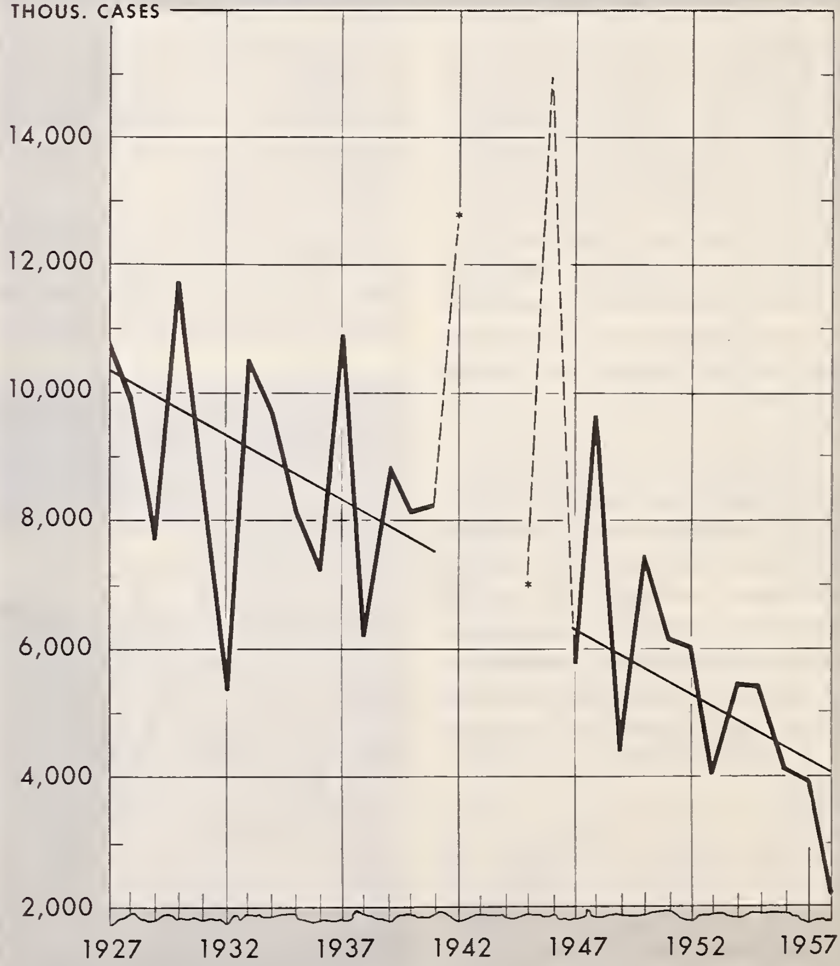
Storage has its greatest impact on prices in the spring when eggs are going into storage—diversion to storage has the effect of reducing the total supply of fresh eggs available for immediate consumption. In the fall, shell eggs coming out of storage are of lower quality than fresh eggs and generally sell at a discount. The greater part of the shell eggs used in the spring for liquid egg production is stored as frozen and dried egg. These products can be stored over an extended period without loss in quality. Because frozen and dried egg can be held beyond the fall, egg prices in the fall are not as greatly affected by storage supplies as egg prices in the spring are affected by diversion to storage and processing into liquid egg.

The reduction in the seasonal swings in production of eggs has been accompanied by a downward trend in the quantity stored. (See fig. 13.) Storage of eggs in shell form has been sharply reduced as a result of the increased availability of fresh eggs in the fall. But storage of frozen and dried egg has remained about unchanged over the years.

PRICE EFFECTS OF QUALITY AND SIZE

Not only does the total quantity of eggs vary with the seasons of the year, but the proportions of the sizes and qualities produced

EGGS: NET INTO-STORAGE MOVEMENT OF COMMERCIAL STOCKS, JANUARY THROUGH JUNE, 1927-58*



* EXCLUDES 1943 AND 1944. IN THOSE YEARS DATA FOR GOVERNMENT STOCKS COULD NOT BE SEPARATED FROM DATA FOR COMMERCIAL STOCKS. TREND DRAWN TO EXCLUDE 1942-46.

U. S. DEPARTMENT OF AGRICULTURE Figure 13. NEG. 6106-59(2) AGRICULTURAL MARKETING SERVICE

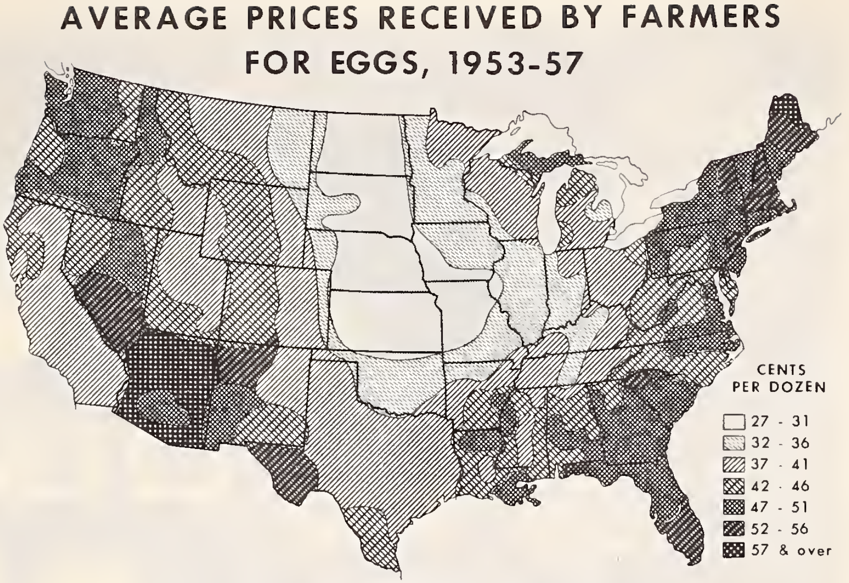

AVERAGE PRICES RECEIVED BY FARMERS FOR EGGS, 1953-57

Figure 14.

U. S. DEPARTMENT OF AGRICULTURE NEG. 7066-59(2) AGRICULTURAL MARKETING SERVICE

also undergo seasonal changes.

Production of high quality eggs usually declines in hot weather. Part of this is due to the increasing age at that time of laying hens. Also, in warm weather quality of eggs deteriorates more rapidly while they are in marketing channels than in cooler weather.

Variations in the size of eggs produced is linked with the age of layers. Pullets first coming into production lay smaller eggs than they do after they have been in production a while. Consequently, the proportions of medium and smaller size eggs is greatest in the fall when the bulk of pullets are coming into production. In the spring, when most layers have been producing for several months, the proportion of the larger sizes is greatest.

Evidence from preference studies and the behavior of prices clearly indicates that consumers prefer high quality eggs and are willing to pay more for them than for lower quality eggs. A consumer expenditure survey made in 1955 indicated that for almost all income groups in the population, more large and extra large eggs were purchased than medium, small, and peewee sizes. Storers of eggs also prefer high quality eggs because they keep in fresh condition longer.

Size and quality thus are factors in the price-making process for eggs. A change in the proportions of the sizes and qualities produced would affect the prices consumers pay. This, in turn, would affect prices farmers receive and their production plans for the future.

REGIONAL PRICE DIFFERENCES

Our discussion so far has dealt exclusively with the average price for eggs received by farmers over the entire country. However, prices vary widely by regions, reflecting the size of production in relation to nearby markets, and differences in distances from markets, in methods of marketing, in quality of eggs produced, and in the seasonal pattern of production.

The price pattern for the United States during 1953–57 is shown in figure 14. In this map, each of the lines indicates areas that have approximately the same annual average prices.

Prices averaged lowest in the West North Central region, a surplus-producing area that is a considerable distance from markets. Generally, the greater the distance from this region, the higher was the price. The highest average prices were received by producers in New England, Florida, and Arizona.

The seasonal patterns for production and prices also show variations by regions. In the South Central region in 1955, for example, monthly production ranged from 133 percent of the monthly average in the spring to 83 in the fall. In the North Atlantic and Western regions, on the other hand, production varied less than 10 percent above and below the annual monthly average.

Seasonal variation in the price farmers receive for eggs usually is least in areas where the average size of laying flocks is largest. This is because farmers with the larger flocks are generally most successful in adopting improved breeds of layers and in using management practices that tend to even out production through the year. By shipping eggs from surplus to deficit production areas, differences among regions and among terminal markets in the region are lessened.

AN OVERALL VIEW

We have examined one by one the major factors affecting changes from one year to the next in the average price farmers receive for eggs. We also have noted how the various factors are related and the approximate degree of influence of each. The next step is to combine this information to get an overall view of the demand,

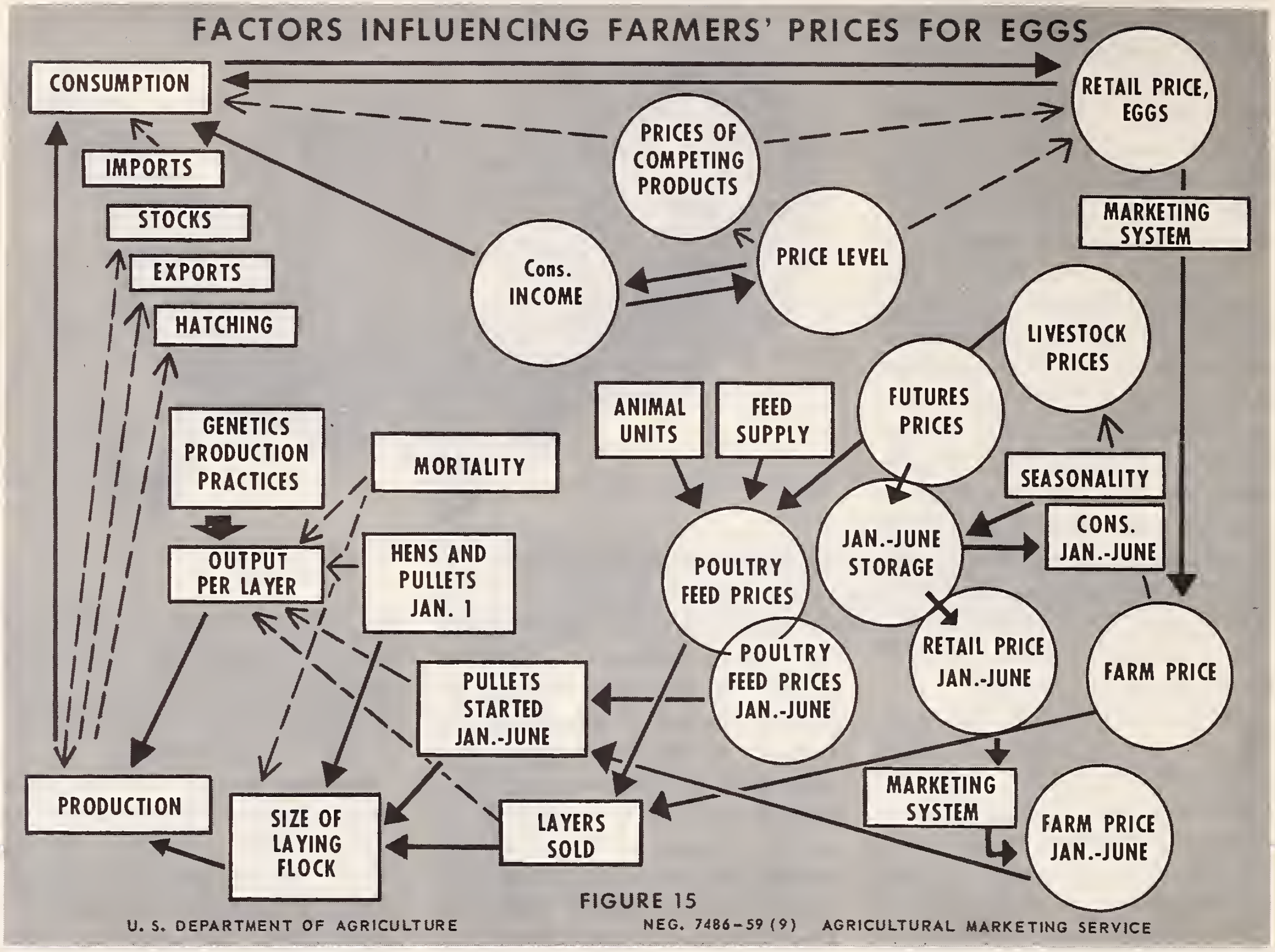


FIGURE 15

U. S. DEPARTMENT OF AGRICULTURE NEG. 7486-59 (9) AGRICULTURAL MARKETING SERVICE

supply and price structure of the egg industry. This is done in figure 15.

The diagram fails, however, to indicate the dynamic nature of the industry. Prices, production, consumption, income, and the other factors are in constant change over time. If we could get motion in figure 15, the ideas of interaction and flow would be clearer.

The price-making process for eggs poses a difficult problem that can be best solved mathematically. In the research on which this bulletin was based, the behavior of these factors was studied over the period (1931 to 1958, excluding the war years 1942–45). A set of mathematical equations was developed to simulate the behavior of these factors. These equations in simplified form and without the mathematical symbols are as follows:

(1) Consumption and price of eggs depend on income, population, and other demand factors.

(2) Consumption of eggs equals farm production plus adjustment for foreign trade, changes in annual stocks, and other minor outlets.

(3) Farm production equals output per layer times size of laying flock.

(4) Size of laying flock equals number of potential layers, January 1, plus number of replacement pullets raised less mortality and less number of layers removed from flocks.

(5) Number of replacement pullets raised depends on January–June egg-feed price ratio.

(6) Number of layers removed from flocks depends on annual egg-feed ratio.

(7) Prices received by farmers for eggs, annually, and January–June, depend on retail prices for eggs, annually, and January–June, and marketing costs.

(8) Retail prices for eggs, January–June, egg consumption,

January–June, and egg storage, January–June, depend on income, population, and other demand factors.

(9) Egg storage, January–June, depends on seasonality in egg production and futures prices.

(10) Egg consumption, January–June, equals egg production, January–June, less egg storage, January–June.

Equations of this kind are useful for the study of the economic situation in the egg industry, and for making forecasts of future changes. This does not mean, however, that all that is necessary to do is to put a set of data into a computer and then read off the answer. In a steadily evolving industry operating in a changing economy, no formula can guarantee a complete answer for the future. The reseacher must keep his studies abreast of the times.

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